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SCHMEISER OLSEN & WATTS
18 E UNIVERSITY DRIVE
SUITE # 101
MESA, AZ 85201

EXAMINER	
RIDER, JUSTIN W	
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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/753,713	NAM ET AL.	
	Examiner	Art Unit	
	Justin W. Rider	2626	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 August 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-23* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-23* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on _____ is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Response to Amendment

1. In response to the Office Action mailed 29 May 2007, applicant submitted a response filed 29 August 2007, in which the applicant amended claims 1-2 and 18 without adding new matter. Previous specification objections have been withdrawn due to amendment.

Response to Arguments

2. Applicant's arguments filed 29 August 2007 have been fully considered but they are not persuasive.

With regards to previously claimed subject matter, applicant argues on p. 10 of Remarks that **Gigi** fails to disclose pitch harmonic enhancement preprocessing of an input audio signal as recited in independent claims 1 and 18. The examiner respectfully disagrees with this assertion.

In the specification, applicant discloses wherein PHE comprises the step of applying a smoothing filter in a frequency domain. If we look at the disclosure of **Gigi**, contained within paragraph [0012] on page 1, **Gigi** discloses wherein, 'the pre-processor comprises a phase-smearing filter to smooth the effect of rapid high energy changes at the input of the quantizer and spectral amplitude warping means to modify the signal spectrum prior to encoding.' Therefore, **Gigi** discloses the use of a filter prior to the encoding process in order to advantageously improve the input signal within the frequency domain so that 'smoothing' the effect of high-energy changes taking place within the input signal can maximize the efficiency of the coding process.

In response to applicant's argument that the examiner's conclusion of obviousness is based upon improper hindsight reasoning, it must be recognized that any judgment on

obviousness is in a sense necessarily a reconstruction based upon hindsight reasoning. But so long as it takes into account only knowledge which was within the level of ordinary skill at the time the claimed invention was made, and does not include knowledge gleaned only from the applicant's disclosure, such a reconstruction is proper. See *In re McLaughlin*, 443 F.2d 1392, 170 USPQ 209 (CCPA 1971).

Further, with respect to the combination of **Gigi**, in view of **Gao**, this secondary reference was simply brought in to provide evidence of the well known existence of 'Pitch Harmonic Enhancement' as a signal processing technique, however, as noted above, **Gigi** discloses the use of preprocessing filters in order to smooth out the volatility present within an input audio signal. Due to this, it is believed that the inference of hindsight should be moot based on the fact that **Gigi** in and of itself wholly discloses the inventive concept as contested within applicant's remarks.

Further, regarding remarks in relation to the introduction of **Tuncer** as a secondary reference, **Tuncer** was brought in to obviate the use of a Multi-Tone Notch Filter, which is well known within the context of digital signal processing and preprocessing.

Further, regarding remarks in relation to the introduction of **Quatieri, Jr.** as a secondary reference, **Quatieri, Jr.** was brought in to disclose signal preprocessing well within the scope of design to one possessing ordinary skill in the art of both applicant's claimed invention as well as **Gigi**, in view of **Gao**.

3. Regarding applicant's amended subject matter addressing the use of signal characteristics to determine coding rates, this will be addressed in the rejections to follow.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1-3, 6, 13 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Gigi (US 2002/0184005 A1)** referred to as **Gigi** hereinafter, in view of **Gao (WO 01/03125 A1)** referred to as **Gao** hereinafter.

Claim 1: **Gigi** discloses a method for pre-processing an audio signal using a smoothing filtering technique to be processed by a codec using a variable coding rate determined based on a characteristic of the audio signal (p. 1-2, paragraphs [0012] - [0014], *'A further input signal for the ADPCM encoder **4** is formed by the codec mode signal,'* this discloses that the codec mode signal is an input characteristic along with the audio signal used in conjunction with energy levels to determine quantization levels and bit rate levels.). However **Gigi** fails to, but **Gao** does specifically disclose a method comprising the step of performing a pitch harmonic enhancement ("PHE") preprocessing of the audio signal, to thereby enhance the pitch components of the audio signal (p. 6, lines 2-7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Gao** in the method of **Gigi** because it employs pitch enhancement to improve the quality of reproduced speech using both forward and backward pitch enhancement (Background).

Claim 2: **Gigi** discloses a method as per claim 1 above, wherein said step of performing PHE preprocessing is to modify the audio signal such that a long-term prediction gain (correction factor) of the audio signal is increased (p. 1, paragraph [0007], *'the energy of the input to the ADPCM encoder increases more gradually, allowing a better choice for (a(c(n)).'* [emphasis added]).

Claim 3: **Gigi** discloses a method as per claim 1 above, wherein said step of performing PHE preprocessing comprises the step of applying a smoothing filter in a frequency domain (p. 1, paragraph [0012]).

Claim 6: **Gigi** discloses a method as per claim 1 above, wherein said step of performing PHE preprocessing comprises the step of applying a smoothing filter in a frequency domain (p. 1, paragraph [0012]) and performing RPE, wherein said step of applying a smoothing filter is selectively performed depending on the property of the audio signal (Figs. 3A-3F; p. 2, paragraph [0021] discloses wherein correction factors are assigned based on indexed quantization levels.).

Claim 13: **Gigi** discloses a method as per claim 6 above wherein scale factors are applied to samples based on certain characteristics (e.g. pitch, step-size) of the signal (p. 2, paragraph [0021]), all in an effort to enhance the output signal by providing a slower step-size adaptation.

Claim 18: **Gigi** discloses a method for pre-processing an audio signal using a smoothing filtering technique to be processed by a codec using a variable coding rate determined based on a characteristic of the audio signal (p. 1-2, paragraphs [0012] - [0014], *'A further input signal for the ADPCM encoder **4** is formed by the codec mode signal,'* this discloses that the codec mode signal is an input characteristic along with the audio signal used in conjunction with energy

levels to determine quantization levels and bit rate levels.); wherein said step of performing PHE preprocessing comprises the step of applying a smoothing filter in a frequency domain (p. 1, paragraph [0012]) and performing RPE, wherein said step of applying a smoothing filter is selectively performed depending on the property of the audio signal (Figs. 3A-3F; p. 2, paragraph [0021] discloses wherein correction factors are assigned based on indexed quantization levels.).

However **Gigi** fails to, but **Gao** does specifically disclose a method comprising the step of performing a pitch harmonic enhancement ("PHE") preprocessing of the audio signal, to thereby enhance the pitch components of the audio signal (p. 6, lines 2-7).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Gao** in the method of **Gigi** because it employs pitch enhancement to improve the quality of reproduced speech using both forward and backward pitch enhancement (Background).

6. Claims 4-5, 7-12 and 19-21 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Gigi** in view of **Gao** as applied to claim 3 above, and further in view of **Tuncer, 'Signal Injection With Perceptual Criteria', Elektrik, Vol. 6, No. 2, 1998, pp. 89-106** referred to as **Tuncer** hereinafter.

Claim 4: **Gigi**, in view of **Gao** discloses a method as per claim 3 above, however failing to, but **Tuncer** does specifically disclose applying a Multi-Tone [Multiband] Notch Filter for decreasing residual energy (p. 93, Section 3, *'Also sharp cut-off and notch type responses can be easily obtained,'*)

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because the specific notch filter design complexity is low and the band limits in a multiband design are easily imposed in the design process (Introduction).

Claim 5: **Gigi**, in view of **Gao** discloses a method as per claim 3 above, however failing to, but **Tuncer** does specifically disclose performing a Residual Peak Enhancement ("RPE") [interpreted as wherein a component within a segment of a signal is designated as a principal component and every other sample within said segment is suppressed] (p. 97, FIG. 5b discloses wherein one component within a sub-band is determined to be above a global threshold, and all subsequent samples are suppressed.).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 12: **Gigi** discloses a method as per claim 5 above wherein scale factors are applied to audio signal samples based on certain characteristics (e.g. pitch, step-size) of the signal (p. 2, paragraph [0021]), all in an effort to enhance the output signal by providing a slower step-size adaptation.

Claim 7: Claim 7 is similar in scope and content to that of claim 4 above and so therefore is rejected under the same rationale.

Claim 8: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claim 7 above, in which **Tuncer** discloses wherein said step of applying MTNF comprises the steps of:

i. evaluating a Global Masking Threshold ("GMT") curve of the audio signal in accordance with a perceptual sound model (p. 95, Section 4); and

ii. selectively suppressing frequency components under said GMT curve (p. 95, Section 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 9: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claim 8 above, in which **Tuncer** discloses wherein said step of evaluating a GMT curve comprises the steps of:

i. normalizing absolute Sound Pressure Level ("SPL") by analyzing frequency components of the audio signal (p. 90-91, Section 2, *'If there is no masker, a signal may still be inaudible as long as its sound pressure level is below the threshold in quiet (or absolute threshold) which is defined in frequency [6]. These masking phenomena should be taken into consideration in creating a perceptual model.'*);

ii. determining tone maskers and noise maskers (p. 90-91, Section 2, *'Masker signal may be tone-like or noise-like. The energy levels for tone-masking noise, ET, and noise-masking tone, EN can be given as [2]'* [*wherein (2) represents* $E_N = E_T + 5.5$]);

iii. reconstructing maskers by selecting a set of maskers among said determined maskers (p. 90-91, Section 2, *'Before attempting to find the masking threshold values, the unpredictability of the audio signal,* U_k*, should be found at each frequency...'*);

iv. calculating individual masking thresholds for the selected set of maskers and calculating GMT from the calculated individual maskers (p. 91, Section 2, under steps for calculating the global masking threshold.).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 10: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claim 8 above, in which **Tuncer** discloses wherein said frequency suppressing step comprises the steps of making the portion below the GMT curve 0 [removing inaudible portions] (p. 95, Section 4, under Signal injection method consists of different steps which can be outlined as:').

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 11: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claim 8 above, in which **Tuncer** discloses wherein said frequency suppressing step comprises the step of multiplying by a cosine smoothing function to the portion below the GMT curve (p. 95, Section 4, *'For example, MPEG-1 layer 1 and layer 2 coders use 32 channel cosine-modulated filter bank for signal energy compaction. This type of frequency partitioning works well but there are alternative structures and procedures that increase the efficiency of the coder.'*).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 19: **Gigi**, in view of **Gao** discloses a method as per claim 18 above, however failing to, but **Tuncer** does specifically disclose applying a Multi-Tone [Multiband] Notch Filter for decreasing residual energy (p. 93, Section 3, *'Also sharp cut-off and notch type responses can be easily obtained,'*)

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because the specific notch filter design complexity is low and the band limits in a multiband design are easily imposed in the design process (Introduction).

Claim 20: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claim 19 above, in which **Tuncer** discloses wherein said step of applying MTNF comprises the steps of:

i. evaluating a Global Masking Threshold ("GMT") curve of the audio signal in accordance with a perceptual sound model (p. 95, Section 4); and

ii. selectively suppressing frequency components under said GMT curve (p. 95, Section 4).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Tuncer** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 21: Claim 21 is similar in scope and content to that of claim 9 above and so therefore is rejected under the same rationale.

7. Claims 14-17 and 22-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over **Gigi** in view of **Gao** as applied to claim 1 above, and further in view of **Quatieri et al. (USPN 4,856,068)** referred to as **Quatieri** hereinafter.

Claims 14 & 15: **Gigi**, in view of **Gao** and **Tuncer** disclose a method as per claims 5 & 6 above, however failing to, but **Quatieri** does, specifically disclose wherein said step of performing RPE comprises the steps of: increasing selected frequency components to corresponding GMT values, thereby enhancing the components at the multiples of pitch frequency relative to other components (col. 5, line 64 - col. 6, line 4, *'Alternatively, the dynamic range compressor 20 can determine a gain from the detected peaks by computing an energy measure from the sum of the squares of the peaks. Again, a desired output energy is computed from the measured sine wave energy according to a dynamic range compression curve and appropriate attack and release times. The gain is then selected to meet the desired output energy. The gain is applied to the sine wave magnitudes prior to interpolation.'* [emphasis added]).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Quatieri** in the method of **Gigi**, in view of **Gao** because it overcomes the issue of speech dispersion by pre-processing a waveform prior to transmission to reduce the peak-to-RMS ratio of the waveform (col. 2, lines 33-37).

Claim 16: **Gigi**, in view of **Gao** discloses a method as per claim 1 above, however failing to, but **Quatieri** does, specifically disclose wherein the method further comprises the step of performing dynamic range compression ("DRC") preprocessing (col. 2, lines 56-62) by an AGC (Automatic Gain Control) preprocessing (col. 3, lines 57-62).

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Quatieri** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 17: **Gigi**, in view of **Gao** and **Quatieri** discloses a method as per claim 16 above, failing to specifically disclose wherein AGC comprises calculating a forward-direction signal level (**Gao**, Fig. 5); calculating a backward-direction signal level (**Gao**, Fig. 5); and generating a processed signal by calculating a final signal level based on said calculated forward and backward signal levels.

However, **Quatieri** does specifically disclose several art equivalent methods of performing automatic gain control on a signal (col. 3, lines 47-64; col. 5, lines 45-63). All of the cited embodiments make use of characteristics of the input signal (e.g. phase, average envelope measure) in order to automatically determine an appropriate gain in order to optimally pre-process the signal.

Therefore, it would have been obvious to one having ordinary skill in the art at the time of invention to include the teachings of **Quatieri** in the method of **Gigi**, in view of **Gao** because of the reasons outlined above.

Claim 22: Claim 22 is similar in scope and content to that of claim 12 and so therefore is rejected under the same rationale.

Claim 23: Claim 23 is similar in scope and content to that of claim 14 and so therefore is rejected under the same rationale.

Conclusion

8. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Justin W. Rider whose telephone number is (571) 270-1068. The examiner can normally be reached on Monday - Friday 7:30AM - 5:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, David R. Hudspeth can be reached on (571) 272-7843. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

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J.W.R.
29 October 2007

DAVID HUDSPETH
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2600